Medication for Motion Sickness

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MEDICATION

Over the years many medicinal remedies have been proposed for the prevention of motion sickness. The number of drugs that has been tested is large, but relatively few are effective (Table 1), and none can completely prevent the development of signs and symptoms in everyone in all provocative motion environments. When the motion is relatively mild and only 10% of the unmedicated population suffer from sickness, then use of a drug such as hyoscine (scopolamine) can increase protection so that all but 2% of the population remain symptom-free. But when the motion is of such severity and duration that 50% are sick when no drug is given, a large dose of hyoscine (1.0mg) still leaves 8% of the population unprotected.[1] In life-rafts, sickness rates approaching 100% have been reported, so it is not surprising that a significant proportion of the occupants will still suffer from sea sickness even when the dose of drug given is sufficient to cause side-effects.

None of the drugs of proven efficacy in the prophylaxis of motion sickness is entirely specific and all have side-effects.[2] Both the anti-histaminics (such as promethazine, dimenhydrinate or cinnarizine) and the anti-cholinergic, hyoscine, are also central depressants and can cause impairment of performance. Hyoscine, at all therapeutic doses, has been shown to cause a performance decrement on tasks requiring continuous attention and memory storage for new information, but only at doses greater than 0.8mg does it interfere with performance of a pursuit tracking task.[3] Promethazine 25mg and cinnarizine at doses greater than 30 mg have also been shown to impair psychomotor performance.[4,5] Other side effects of hyoscine, notably blurred vision, sedation, dizziness and dry mouth, may also contribute to performance decrement.[6]

There is thus good reason for the general rule that anti-motion sickness drugs should not be taken by aircrew, and should under no circumstances be taken by a pilot when required to fly. There is a place for the administration of prophylactic drugs to susceptible student aircrew, particularly during the early stages of flying training when accompanied by an instructor. However, there is evidence to suggest that hyoscine, whilst allaying symptoms, does interfere with the acquisition of protective adaptation. This is one reason why the continued dispensation of anti-motion sickness drugs to aircrew is to be deprecated; another is that such a pharmacological "crutch" is not compatible with operational duties.[7,8] An exception may also be made for aircrew who are not in primary control of the aircraft, such as rear crew members in maritime reconnaissance or hurricane penetration flights. For them the administration of one of the drugs whose side effects are slight (e.g., cinnarizine) may be entertained and could well be beneficial.

No such restrictions apply to the use of drugs by passengers for the alleviation of motion sickness. Paratroops and other personnel who must operate at peak efficiency on leaving the aircraft or at the end of a flight are a possible exception, though the putative performance decrement attributable to motion sickness and that due to drug side-effect is a dilemma to be assessed only with detailed knowledge of all facets of the operational situation. The choice of prophylactic drug is, in part, dependent upon the foreseen duration of exposure to provocative motion and, in part, upon differences between individuals, both in the efficacy of a particular drug and the severity of side-effects. So if, in practice, one drug is not effective or not well tolerated, then it is justifiable to give another drug or combination of drugs.

Where the therapeutic objective is to provide short-term protection, oral *l*-hyoscine (syn. scopolamine) hydrobromide (0.3 – 0.6mg) is the drug of choice. This acts within ½ - 1 hour and provides protection for about 4 hours. Side-effects can be troublesome and tend to be accentuated if repeated administration (at 4 – 6 hour intervals) is required for more prolonged prophylaxis. With the development of

transdermal drug transport techniques, it is now possible to provide a loading dose of 200 μg hyoscine, followed by controlled release at 10 μg/h for up to 60 hours, by means of a patch placed behind the ear (the Transdermal Therapeutic System or TTS). The protection afforded by TTS is reported to be comparable with that achieved by oral hyoscine, but there does appear to be greater inter-subject variability in both the efficacy and the incidence of side-effects than is found with repeated oral administration of the drug. When hyoscine is administered transdermally, peak blood levels are not reached until 8 – 12 hours after application of the patch, so it is necessary to anticipate a requirement for prophylaxis by at least 6 hours.[9] The antihistamines, promethazine and meclozine, when taken by mouth are absorbed more slowly than hyoscine and are not effective until about 2 hours after administration, but they provide protection for at least 12 hours. Other drugs in the same group, such as cyclizine, dimenhydrinate and cinnarizine, are absorbed at about the same rate although their duration of action is shorter, i.e., about 6-8 hours. Somewhat atypically, the peak therapeutic effectiveness of cinnarizine is not achieved until some 4 hours after ingestion even though the concentration of the drug in blood is at a maximum at 2 hours.

The demonstration that *d*-amphetamine increases subjects' tolerance to cross-coupled stimulation led to an evaluation of the use of this analeptic in combination with the established anti-motion sickness drugs.[10] It was found that there was a synergistic increase in prophylactic potency and a decrease in the sedation which is a common side-effect of hyoscine and the antihistamines. Ephedrine is almost as effective as amphetamine in enhancing the efficacy of the anti-motion sickness drugs and should be used in preference to amphetamine when prescription of this potentially addictive drug is contraindicated.

Assessment of therapeutic potency both in laboratory and in field trials has indicated that the combination of *l*-hyoscine hydrobromide (0.3mg) with ephedrine sulphate (5mg) is most effective for short-term (4 hours) protection. In situations requiring more sustained prophylaxis the combination of promethazine hydrochloride (25mg) with ephedrine sulphate (25mg) is recommended.[6]

Vomiting that is severe and repeated can lead to dehydration and loss of electrolytes. If this occurs in a survival situation (for example, on a life-raft) it may cause breakdown in morale, loss of interest in surroundings, and a loss of ability to co-operate with rescue attempts. In such cases attention should be given to the following:[11]

1. Maintenance of intake of fluids and electrolytes.

2. Use of drugs. These must be given parenterally. If given by mouth they may not be absorbed or will be returned with the vomit. The following preparations are recommended:

Drug	**Dose** ***(mg)***	**Route**
Hyoscine (scopolamine) hydrobromide	0.1-0.2	Intramuscular injection
Cyclizine lactate	50	Intramuscular injection
Promethazine hydrochloride	25-50	Intramuscular injection.

3. Supportive measures. Make the patient lie down, attend to general comfort and give reassurance.

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Table 1. Adult dosage and duration of action of anti-motion sickness drugs

Drug	Route	Adult Dose	Time of Onset	Duration of Action (hr)
Hyoscine HBr (Kwells®) (Scopolamine)	Oral	0.3 – 0.6mg	30 min	4
Hyoscine HBr	Injection	0.1 – 0.2mg	15 min	4
Hyoscine HBr (Scopoderm TTS®)	Patch	One	6 – 8 hr	72
Promethazine HCI (Phenergan®)	Oral	25 – 50mg	2 hr	15
Promethazine HCI	Injection	25mg	15 min	15
Dimenhydrinate (Dramamine®)	Oral	50 – 100mg	2 hr	8
Dimenhydrinate	Injection	50 mg	15 min	8
Cyclizine HCI (Marzine®)	Oral	50 mg	2 hr	6
Cyclizine lactate (Valoid®)	Injection	50mg	15 min	6
Meclozine (Sea-legs®)	Oral	25 – 50mg	2 hr	8
Cinnarizine (Stugeron®)	Oral	15 – 30mg	4 hr	8

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